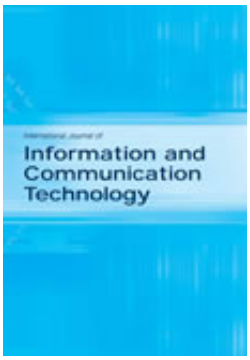

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EFL teaching based on big data analytics in mobile AAC system

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Abstract: Augmentative and alternative communication, the mechanisms that may complement or substitute formal language in certain situations, tends to lead to technological assistance in English as a foreign language (EFL). In this context, this paper discusses the mobile AAC concept, which can enhance EFL teaching performance. The article proposes a hybrid approach to EFL using big data analytics and mobile AAC (EFLAAC) to facilitate smooth access for mobile learners to educational digital content on various mobile devices. The compression and decompression program in the new framework compress the file during the streaming without changing the quality. A systematic subjective analysis has been carried out with dataset of 250. The proposed model is evaluated and delivers high learning results from multimedia instructional videos using pre- and post-test questionnaires. EFLAAC attains 94.9% of accuracy, which is comparatively good than other approaches.

Keywords: EFL teaching; mobile augmentative; alternative communication; big data analytics; digital learning.

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Biographical notes: Junsheng Li graduated from Sichuan International Studies University in 2009. From then on, he has been working in School of Foreign Studies in Weinan Normal University, as a Vice Professor, and Vice President of School of Foreign Studies, mainly studying English language teaching and cross-cultural research.

1 Introduction to communication and augmentative and alternative communication

Communication is an inherent function among all human beings and a fundamental requirement for transmitting and collecting knowledge, thoughts, attitudes, and perceptions to understand and intervene (Hirneisen, 2020). A birth deficiency in chi learning interacts by various codes. Communication is the process of contact between humans in which individuals share a response in a vocabulary or a mode of speech. The language that corresponds to the individual's thoughts in any person is one of the principal forms of communication. Via expression, humans can express our ideas, feelings, and atmosphere (Moorcroft et al., 2019).

Language learning has various causes: genetic, psychological, and psychological factors that affect speech therapy difficulties (Kadry and Ghazal, 2019). Abnormalities in speech development lead to problems in making the required sounds. There is a barrier to knowing and using words properly to interact (Ogletree et al., 2018) effectively.

In another direction, it has now become a tool to operate for teachers and generous support for individuals with autism by using information technology (ICTs) in schools as those frameworks help write, reading and understand (Shegay et al., 2020) to enhance their quality of living and also to have more resources in the educational sector.

The three methods are the technique and job techniques:

1 Evaluation: A previous appraisal is essential to define the group's demands to evaluate the use of communications assistance (Manogaran et al., 2020). To understand each case's opportunity, desires, and inspiration, access to the various forms of impairment involved is essential.

2 Check for tools or applications: a suitable program is chosen to assess the extent of the situation (Klimova, 2018). It is necessary to decide whether additional applications are required, i.e., to promote and interfere with establishing language equivalents or with communicating with others.

3 Implementation and preparation: support is offered in the program before they are autonomous of the software necessary by the individual disabled person (Mei et al., 2018). Eventually, to make sense of the requirements, the preceding abilities for additional concepts and methods must be recognised at the alternative approach levels (Manogaran et al., 2020).

The rest of the research work as follows. Section 2 shows the literature review and background of communication and augmentative and alternative communication. Section 3 deals with the design and implementation of the proposed EFL using big data analytics and mobile AAC (EFLAAC). Section 4 shows the software implementation and simulation analysis of the proposed EFLAAC system. Section 5 deals with the conclusion and discussions of the proposed method.

2 Background to communication and augmentative and alternative communication

Several experiments have had a considerable effect on their study on five learning disabilities in wellbeing and computer vision (Kacetl and Klímová, 2019). Klimova (2018) at the College of Wellington, various health problems are observed, such as those often obscured by healthcare professionals and shared in the severely autistic population. These diseases include some medical conditions, including intestinal, epileptic, cardiovascular, asthma, and indigestion, among other disorders (Wu et al., 2018). AAC systems should deeply address those issues to guarantee that they are conveyed and adequately treated to medical practitioners.

Different experiments investigating the feasibility of new AAC systems have been carried out (Tso, 2020). Rosell-Aguilar (2018) found many similar concerns around various AAC systems: operating challenges and period; variability; reduced resilience, self-assurance, and cost. The progress of these innovations has been driven by consistent access to resources. Ahmed et al. (2019) agreed that AAC software incorporated into

mobile technology daily would alleviate such issues. They raise their problems, including limited screen resolution; and ability to be implemented without considering the user's unique requirements (Makoe and Shandu, 2018).

Present communications support in a healthcare area is designed to adapt the healing alliance to the patient's specific requirements (Son, 2018). Singh et al. (2020) have used the Talking MatsTM system to evaluate an individual with milestones in intellectual disabilities' depressive symptoms. The photographs shown to the patient demonstrate the significant elements of his life and encouraged him to openly and comfortably explore each part, contributing to successful management (Ryabkova, 2019).

Consequently, in primary care in the UK, hospital passes like that mentioned by Cabrera-Solano et al. (2019) are increasingly being developed. The passes gather valuable personal knowledge to customers about their healthcare requirements (connectivity patterns, climate, nutritional needs, etc.), ensuring that workers communicate regularly to satisfy their specific preferences (Kumari et al., 2018).

Fixing the challenges of persons with learning disabilities during their everyday jobs has led to the advancement of various approaches and methods to help a person with CP speak to make up for specific difficulties (Hoyos and Velásquez, 2020). In the mid-1960s, the very first AAC services were established in Toronto, Canada (McNaughton et al., 2019). Individuals who struggle to deliver oral communication due to serious speech or language disabilities use AAC. AAC may complement or replace verbal communication for individuals who are deaf or hard of hearing. The AAC services were used. The use of hand signals and symptoms to convey information with expression disability has motivated caregivers and exceptional educational instructors (Aujla et al., 2018). A multi-step AAC protocol for persons' assistance to effectively communicate was founded in 1982s as a photo enabled coordination device (PEC) (Simacek et al., 2018).

Given the advantages of PECS, significant limits also remained. Before using AAC innovations in preconfigured AAC software used exclusively for data communication, it provided tools to develop contacts approaches (Light et al., 2019). These technologies empower an individual to interact with digital and mechanical speakers and render the exchange of information more normal (El-Hasnony et al., 2020).

Although AACs are advanced in technology, speech generators (also regarded as voice-output mobile phones) are incredibly costly, hard to schedule or customise, and not compact enough to satisfy the market's requirements. AAC software (app) is designed to maximise AAC instruments while generating a more portable resource (Duggan and Walsh, 2019). This method is a landmark for creating AAC software, which also hits the science and scholarly applications for improving contact between personnel and physicians in hospital settings established by Ostroff and Da Fonte (2018). By presenting notifications on a screen, the software has facilitated communication (Varatharajan et al., 2018). Elmquist et al. (2019) have created an app with a framework of pictographs that can be validated on mobile devices through video decoding, grouped in categories and subcultures to format communications statements. Baraiolo (2020) also created a contact design software framework. Manogaran et al. (2020) have sports setting AAC app built.

Android phone applications were created that enable people to connect via the music playback functionality in complicated settings using 372 regular sentences (Rosli, 2019). Although published research in the AAC application production increased, there was little available research (Ahmad, 2018). Consequently, for many people, the expected gains will not be achieved, not that they did not recover through AAC, but quite like to

whether the AAC applications for people with severe disabilities are just difficult mainly to be using (Shakeel et al., 2021).

It is also essential that programmers use modern technologies to build more useful applications for the disabled to reduce their disabilities and their freedom, satisfaction, and personal involvement (Rinaldi, 2019). In this light, the purpose of this analysis is to create an AAC method that will be tailored to each CP participant's particular engine complexity properties (Nieto et al., 2019).

Nevertheless, our study takes the form of a survey application that assists people with chi learning problems in communicating on their emotional stability. In their development of the application, many of the assumptions made are known to be necessary, including a need to send one question, the inclusion in each section of tiny sample size, and the use of different modalities for providing the data. The first findings of the analysis were positive, and most users became capable of completing the questionnaire consistently. This research indicates future success in the precision of medical knowledge provided by these innovations.

3 A proposed hybrid approach to EFL using big data analytics and mobile AAC

3.1 Features

The English text recommendation is EFLAAC's essential function. Several words that can be pressed to auto-complete a phrase are offered to consumers while typing. When the notification is ended, a bigger surface view is available for streaming. This method makes it possible to show hope to the community with which the user communicates. Users can modify a response which, upon approval, will generate a new answer. The EFLAAC knows every freshly typed statement; the framework adapts its recommendations through mutual interactions.

Figure 1 Word prediction framework for the proposed hybrid approach to EFLAAC (see online version for colours)

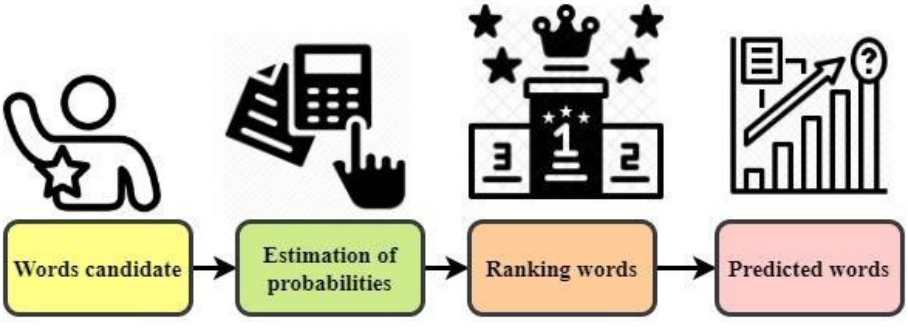


Figure 1 shows the word prediction framework for the proposed hybrid approach to EFLAAC. It receives words from the candidate and estimates the probabilities of the words. Based on the ranking of terms, word prediction is made in the proposed method. Big data analytics is used for ranking the phrase, and the AAC concept is used to find the probable word for the user's communication. EFLAAC has a variety of developing

countries mentioned below, both for the person and the health professional. EFLAAC shows messages already entered in two databases: and everyone addresses books. For the All List originally, all joined in communications are reported. Customers have the opportunity of tagging and documenting a contact or several images in the directories folder. The elimination of notifications from a file in one of the other lists would not erase its equivalent. If the user wishes a document to be included, it will be taped through one of the databases. The level of its use and recital of use of either list can indeed be categorised.

In the overflowing display of the program response bar, functions that are most likely to be seen by clinicians would be covered. The consumer will view and control the amplitude of each prior written phrase. There are three items that an account consumer can do: update, importing, and exporting.

The profile restart wipes all stored records, except acquired vocabulary and comments, clear. Users developed terms and communications will be held in a different file when uploading an account. The whole file can indeed be distributed somewhere else, which can be accessed by any EFLAAC computer. The importing feature does this.

Eventually, the beneficiaries of the communication may want to score their general comprehension. The greater the criterion (no matter if spelling errors were conceivable), the further the consumer was aware of the ranking. Underneath the broad view, there is a rating tab. A 5-star ranking system will show when pushed. This function is planned to use for medical professionals just before a controlled experiment.

3.2 Implementation

EFLAAC is an Android-based smartphone AAC program. EFLAAC was produced and used the mobile software development kit (SDK) and utilised the mobile GUI. The conditional probability is shown in equation (1).

$$P\left(w_n \left| w_{n-1}\right.\right) = \frac{P\left(w_{n-1}, w_n\right)}{P\left(w_{n-1}\right)} \tag{1}$$

w_n – term expected, w_{n-1} – preceding period, and the conditional probability to the expected to the preceding word is denoted as $P(w_n|w_{n-1})$. The probability of the preceding term concerning expected is given as $P(w_{n-1}, w_n)$ and the probability of the preceding term is denoted as $P(w_{n-1})$. It is used to find the probability of a particular word. Ice Cream Sandwich and Jelly Bean, and KitKat are now available. A summative description of the preprocessing and development of EFLAAC.

Figure 2 Pictorial representation of $P(w_n|w_{n-1})$

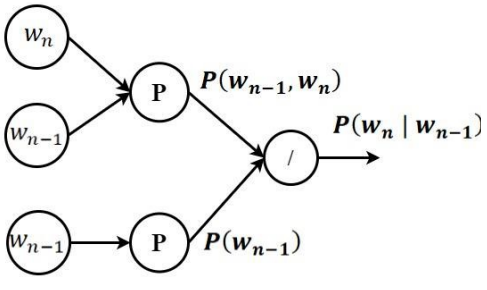


Figure 2 shows the pictorial representation of $P(w_n|w_{n-1})$. w_n – term expected, w_{n-1} – preceding word, and the conditional probability to the expected to the preceding period is denoted as $P(w_n|w_{n-1})$. The probability of the preceding term concerning expected is given as $P(w_{n-1}, w_n)$ and the probability of the preceding term is denoted as $P(w_{n-1})$. A predictive indicator dependent on the n-gram framework is being used to promote EFLAAC's word recommendation. A bigram template is being used, in particular (2-gram). The bigram determines the possible next term by using the preceding phrase. Basic backoff optimisation is used to treat negligible bigrams centred on the side Katz template. In our bigram pricing structure, the equation is used. When this situation happens, an $(n - 1)$ gram, vector space template, is supported in the method. Unigram template is used to list recommendations using the already typed term.

Both before and throughout the preprocessing phase, the odds are calculated. The first data preprocessing measurement discusses the whole first corpus, used as a basis of an unchanged EFLAAC edition. Using the app, the smartphone updates and recalculates the odds by typing messages from the person. EFLAAC relies only on the English text submissions in the Palito Program Database at the College of De La Salle, an English corpus inventory from separate documents.

EFLAAC uses an SQLite repository of multiple systems, called BigramTable and MessageTable, to process data for each phrase and post. BigramTable has numerous domains. The Bigram Register is a collection of terms with their accompanying probability in the specified line after the word has happened. A name is defined in the specification as a WordCount school with the following traits: wordID (intéger) that matches a provided word's number ID, counting (algorithm), that matches the number of words in the vocabulary, and probability (float), that matches the possible Name for it to appear when included as one of the databases of the bigrams of some other phrase.

Three major global stored procedures are being used to promote the text recommendation function:

- BidiMap name to the phrase (2-way map) – this method is a specialised hash mapping that can scan numeric values in opposite paths. The smart contract contains the term as a sequence and the necessary numerical identification. The Name is used for word questions using BidiMap, and the other way round. The key aim of this would be to move the Name to the phrase.
- UnigramList collection – the collection of WordCount entrants is short. In essence, this is the complete database of the corpus terms, sorted according to their occurrence.
- Map – this is a diagram with the WordID numerical symbol and the WordCount entry list, ordered according to the probabilities. This method shows the number of items identified by WordID after a specific phrase occurs.

Term estimation accelerates the process of the context menu by increasing subsequent user behaviour. To do that and because several input terms as practicable must be anticipated by design, i.e., they fit the participant's intended phrase.

Generally speaking, following the words encountered in the statement may be interpreted the form of clearly showing that most typically happens:

1 source knowledge: list of phrases that fit the user behaviour series;

2 an estimate of the possibilities of a term nominee is made in the context of foreign language design, taking into account the appropriate action of the statement;

3 the probability rating of terms and the 'by design' description;

4 knowledge about the outcome: term prediction.

The estimation approach is meant to include a list of terms ordered according to measured parameters. The likelihood of each person's political word is calculated in terms of the vocabulary model was utilised the corpus of language numbers.

By applying two phases, the development of the prevision approach is presented:

1 estimation of the possible terms with the predictive classification algorithm to make an appropriate computation cost question (for smartphone deployment potential)

2 development of a Ukrainian-speaking language corpus to increase direct employs and to minimise user-to-appear communication.

For auto-correct sentences, machine translation features are being used. In the communication system, the N-gram formula for clearly showing is used to measure the likelihood during the last phrase in a document corpus as the word's frequency.

The maximum probability evaluation (MLE) approach is used to measure these odds. It involves evaluating the conditions that increase the chance for those terms. From uniform counts from a demographically sound corpus of a feature vector, the MLE approximation for an N-gram numerical attributes. The conditional probability is shown in equation (2).

$$P(w_n | w_{n-1}) = \frac{C(w_n, w_{n-1})}{C(w_{n-1})} \tag{2}$$

For instance, despite the past word w_{n-1}, the value of the phrase bigram can be calculated, for obvious reasons, by estimating the entering (counts) of bigrams $C(w_n, w_{n-1})$ and normalised unigram phrase is used as w_{n-1}. The purpose of data scattered, with growing basis functions, is among the N-gram frameworks' most critical challenges. In truth, the MLE gives a null chance for any group of absent tokens. It is proposed that a system with such a backoff should be employed with the enhancement of the specifications to fix the problems of fragmented information and increase the total efficiency of the forecast without growing computational burden. The Katz backoff framework will fulfil these criteria in a small vocabulary of terms the mathematical model vocabulary.

Figure 3 Pictorial representation of $P(w_n|w_{n-1})$

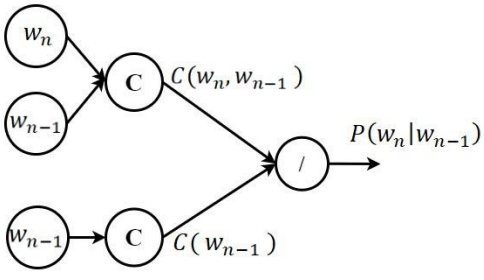


Figure 3 shows the pictorial representation of $P(w_n|w_{n-1})$. The input is given as w_n, it is the actual value. The expected value of the same is denoted as w_{n-1}. The function C is used to find the output of the system. The output $C(w_n, w_{n-1})$ is divided with $C(w_{n-1})$ and the final probability received is $P(w_n|w_{n-1})$. Based on the category when N-grams of greater magnitude are not present in an educational entity, the critical principle motivating Katz's backoff system is to measure the dependent likelihood of a term in data transmission to both the N-gram significantly lower importance. The prototype is used to generate the best outcomes, with one of the complete understanding.

In specific, the trigram approach has been suggested for the most extensive range N, as well as the part-of-speech and illegal manner are repetitively backed off and expressed in equation (3).

$$P_{BO}\left(w_n \middle| w_{n-2}, w_{n-1}\right) = \begin{cases} P\left(w_n \middle| w_{n-2}, w_{n-1}\right) & \text{if } c\left(w_{n-2}, w_{n-1}, w_n\right) > 0 \\ \alpha\left(w_{n-2}, w_{n-1}\right) P\left(w_n \middle| w_{n-1}\right) & \text{if } c\left(w_{n-2}, w_{n-1}\right) > 0 \\ P_{BO}\left(w_n \middle| w_{n-1}\right) & \text{else} \end{cases} \tag{3}$$

where

$$P_{BO}\left(w_n \middle| w_{n-1}\right) = \begin{cases} P\left(w_n \middle| w_{n-1}\right) & \text{if } c\left(w_{n-1}, w_n\right) > 0 \\ \alpha\left(w_{n-1}\right) P\left(w_n\right) & \text{else} \end{cases} \tag{4}$$

$$P\left(w_n \middle| w_{n-2}, w_{n-1}\right) = \frac{C\left(w_n, w_{n-1}, w_{n-2}\right)}{C\left(w_{n-2}, w_{n-1}\right)} \tag{5}$$

P_{BO} – likelihood determined from the prototype backoff of Katz, P – smooth expectation, good-Turing approximate number, C – N-gram amount, w_n– term expected, $w_{n-}2$, w_{n-1} – preceding terms, α – backoff parameters. The conditional probability to the expected to the preceding term is denoted as $P(w_n|w_{n-1})$.

To improve the estimation of the equation α for the bid to be taken as equivalent to 0.4, which Microsoft's dumb backoff (SBO) specialist algorithmically get. It has no meaning and is close to other predictive awareness of good for a small corpus of terms.

For any backoff amount r, it is determined by equation α', where $r = 0$ for trigrams, $r = 1$ for bigrams, $r = 2$ for unigrams, the magnitude of data transmission for word vectors is computed. Therefore, by the simpler approximation S_{sim}, the significant level determined takes the form is expressed in equation (6).

$$S_{sim} = \alpha' P \tag{6}$$

where

$$P\left(w_n \middle| w_{n-2}, w_{n-1}\right) = \begin{cases} \dfrac{C\left(w_n, w_{n-1}, w_{n-2}\right)}{C\left(w_{n-2}, w_{n-1}\right)} & \text{if } C\left(w_n, w_{n-1}, w_{n-2}\right) > 0 \\ \dfrac{C\left(w_n, w_{n-1}\right)}{C\left(w_{n-1}\right)} & \text{if } C\left(w_n, w_{n-1}\right) > 0 \\ \dfrac{C\left(w_n\right)}{N} & \text{else} \end{cases} \tag{7}$$

α– backoff correlation, r – backoff degree value, P – backoff random effect likelihood, C – N-gram amount, w_n – word projection, w_{n-2}, w_{n-1} – phrase precedence, N – unigrams total number. This function describes S_{sim} as the phrase 'by definition' with the supports good.

Figure 4 The big data architecture for the proposed hybrid approach to EFLAAC (see online version for colours)

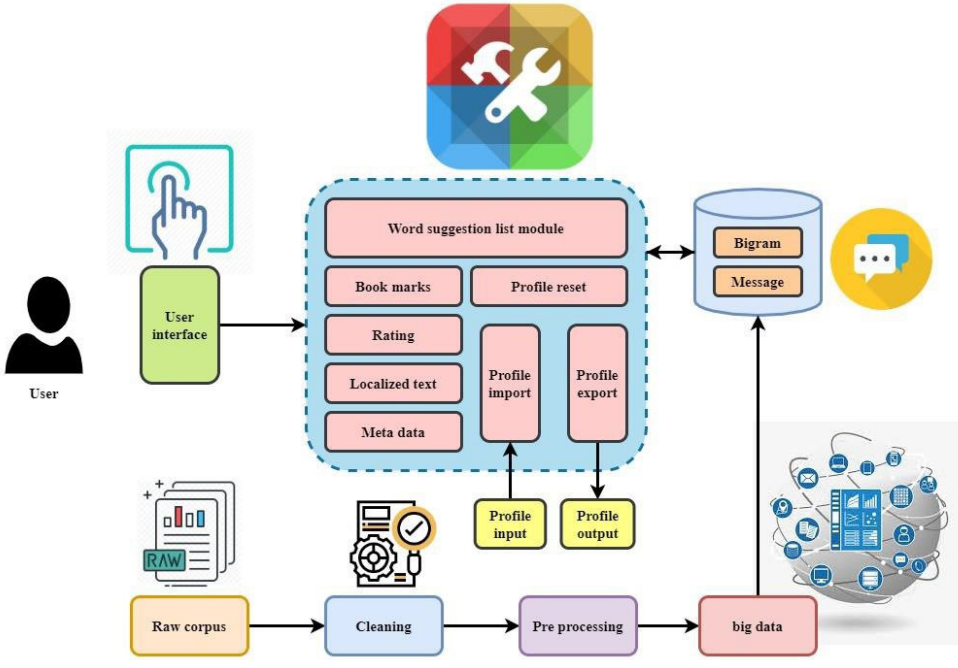


Figure 4 shows the big data architecture for the proposed hybrid approach to EFLAAC. Big data analytics is merged with mobile AAC (EFLAAC) for enabling the questionnaire session in the learning. It consists of the raw corpus, cleaning, preprocessing of data, big data, and bigram or message. Initially, the user received the information with the user interface, then processed it with the modules. The module is divided into word suggestion list, bookmarks, profile reset, rating, localised text, metadata, profile import, and export data. The profile input and output data are used to import and output modules. Language learning encourages teachers, through words, speeches, and alternate methods, to connect with others. The individual may ask for what he wants and ask for people to realise in this process. Teachers can be inspired with new vocabulary, speeches, and alternative language learning approaches as they communicate with others.

Many programs and studies promoting learners' communicative mechanisms exist at the moment, in this sense. However, neither the public nor disabled people are familiar with most such ventures and studies.

This function is due to numerous factors, such as the absence of plan absorption; the internet companies do not archive the very first performance; a slight weakness in the basic definition of a territory and in the extent of its membership in that dominion is due to the limited usability of the motive technology delivery channels

However, the proposed model aims to reduce mobile programs' discovery, connect, categorisation, affiliation level, and collection of functionality, which means the potential of mobile communication appropriate processes for physical therapists, parents, and youth. The stages such as idea formation, encoding, channel selection, decoding, and feedback are included.

The framework consisted of four devices that incorporate a smartphone app database and the speaker's regular expression qualifications and professionalism. The database program was designed using the Java programming vocabulary, while the mobile customer used Android. The following defines any element and element:

- Information base: clinicians and response evaluation established a classification system of information processing. It was essential to keep in mind the capabilities for gradual and complementary approaches for mobile apps of individuals with autism.

  Likewise, database questions have been used to assess the degree or likelihood of assistance for diverse graphical, behavioural, engine, and perceptual disorders.

  0%, 50%, 75%, and 75% likelihood of assistance for students with cognitive, cognitive, and sensory and auditory disorders, as identified by professionals, are available in the communications committees. A coordination platform can not be used to explain to visually disabled individuals because they do not have an understanding of nature. Still, a participant with autism spectrum disorder has a 50% probability and 75% potential to use them with mechanical and incremental individuals.

- Mobile architectures: there are two mainly nationwide android devices. These were all available for IoS with 73% and 19% separately, so we wanted to narrow our search of smartphone apps using both software applications.

  In that sense, the Play Store App (https://play.google.com/) and FMD (https://fnd.io/) social networking distributor sites for Android and IOS separately were examined.

- Check and retrieve: search and excerpt includes links to other site's addresses for analysing articles and looking for references to the latest updates. The documents are then uploaded, and the contents are collected for classification.

- Crawler: a domain-focused crawler and the purpose enable websites to be gathered on the Network related to a particular question. In essence, the crawler function asks an HTTP, GET or database question variable and replies in html template with the document. To accomplish that, researchers are using the Scrapy platform that makes it simple and effective to derive insights from the Internet:
  a the element of the question was extracted from the data warehouse, using the critical competencies of each alternate and additional form of communication and vocabulary
  b selection policies also specified the indexing of only English requirements. In comparison, the connections to based processes displayed in the Play Store are also indicated.

- The NLP: processing of smartphone apps attributes is part of the processes. Natural language processing (NLP). The channel model can, therefore, easily be influenced by the raw materials. This attempts to derive the appropriate material of the smartphone app's definition from the linguistic form's encoding.

  To do this, researchers have used NLTK, which includes several speech recognition databases and applications. A sequence of pre-and knowledge extraction steps has to be carried out to strengthen the information deference methods of data extraction to enhance the corpus to enhance classification precision.

- Data mining: data analysis is an information development stage that is usually automated or moderately. Data mining methods are rapidly growing since they permit valuable information in broad datasets according to the application; the present findings have been used to learn anomalies automatically.

- Data archive: repository services make it easier to obtain intelligence, preserve and organise virtual images. Information for improved identification and performance is now added.

- Registry: it is essential to provide a business analytics system that facilitates accurate accessibility to the knowledge requested, retrieved, stored, and categorised. As a response, PostgreSql was determined to be installed for site information gathering and use.

- Online services: the use of web applications is one means of sharing knowledge. The aim is to isolate the archive from the numerous clients who may be associated with the increase. To ensure collaboration among different interfaces and operating systems and differentiate between various database procedures and custom software.

4 Simulation analysis

In this section, the proposed hybrid approach to EFL using Big Data Analytics and Mobile AAC (EFLAAC) is implemented and analysed. The input parameters are assumed partially, and some values are received from the student's AAC device. The output parameters like effectiveness, quality of the prediction, student feedback for the positive and negative questions, and SUS score are analysed in this section.

Table 1 Simulation parameters

Parameters	*Value*
Number of students	100
Number of teachers	5
Dataset	250
Reciprocity	American_English

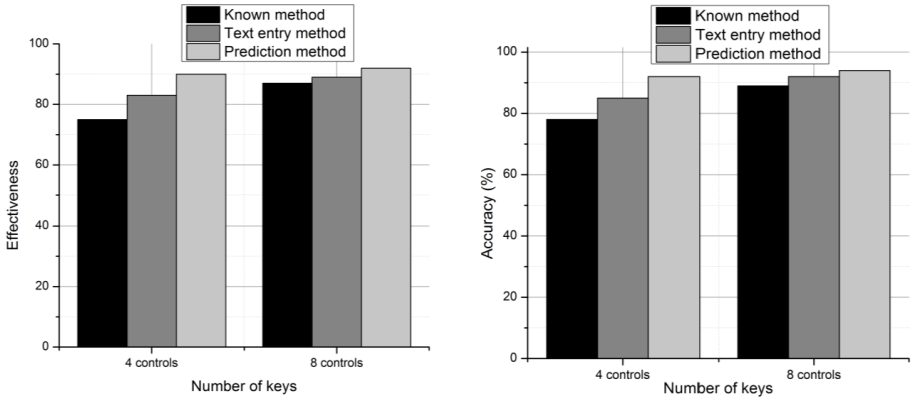
Table 1 shows the simulation parameters for the proposed hybrid approach to EFLAAC. The number of students for the simulation taken as 100 students, the number of teachers taken as 5, the dataset is 250, and the interchange is taken from American English.

Table 2 Compatibility of the proposed hybrid approach to EFLAAC

App	*Speech analysis*	*Pictographic view*	*Screen planning*	*Access scan*	*Words select*	*Resource select*	*Add source*
ELFAAC	√	√	√	√	√	√	√
CA	X	X	√	X	X	√	X
VOX	√	√	X	X	√	X	√
MAAC	√	X	X	√	X	√	X
Tump AAC	√	X	√	X	√	X	√

Table 2 shows the hybrid approach's compatibility with EFLAAC. The existing systems like CA, VOX, MAAC, and Tump AAC, are analysed and compared with the proposed hybrid approach to EFLAAC. The systems' capacity is analysed, and the features like speech analysis, pictographic view, screen planning, access scan, words select, resource select, and add source are analysed. The capability enabled is marked √.

Figure 5 Effectiveness comparison in terms of (a) effectiveness and (b) accuracy of the proposed hybrid approach to EFLAAC



(a) (b)

Figure 5(a) shows the effectiveness of the proposed hybrid approach to EFLAAC. The mobile app is designed with four control keys and eight control keys. The effectiveness of the app is analysed using student feedback. The methods like known method, text entry method, and prediction method are analysed, and eight controls have the highest effectiveness comparing two control data. In eight control data, the prediction method has the highest efficiency. Four-known control way has the lowest energy.

Similarly, Figure 5(b) shows the accuracy of the proposed hybrid approach in percentage to EFLAAC. Even here, the mobile app is designed with four control keys and eight control keys. In eight control data, the prediction method has the highest accuracy. Four-known control way has the lowest accuracy.

Figure 6 SUS score of the proposed hybrid approach to EFLAAC (see online version for colours)

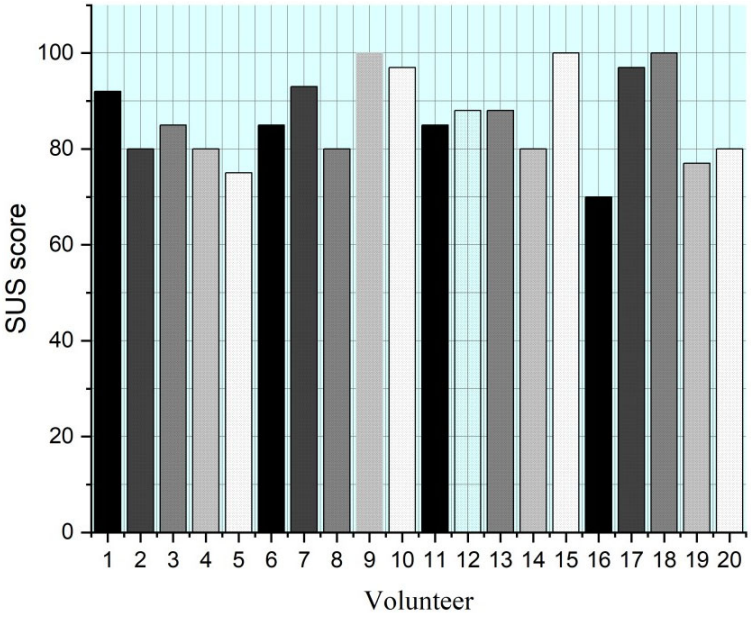
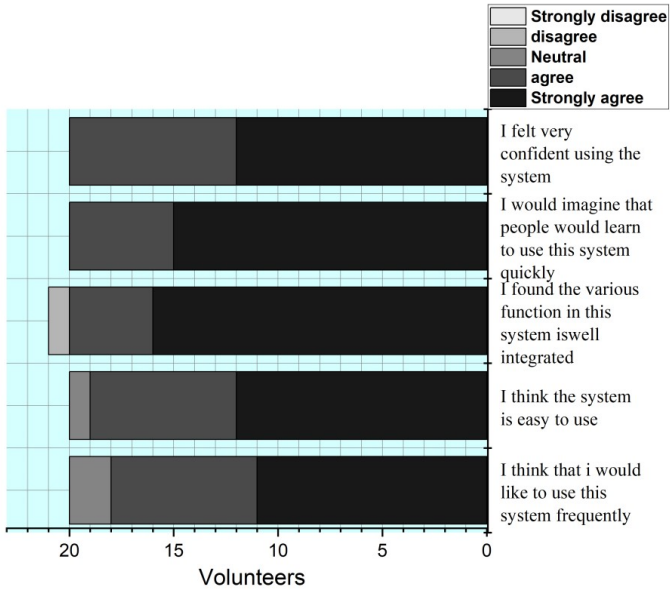


Figure 6 shows the suitable for usable software (SUS) score of the proposed hybrid approach to EFLAAC. SUS score is calculated for the volunteers. The simulation result shows the SUS score for the student on a scale of 100. The majority of the users get a score above 70. This result indicates the proposed hybrid approach to EFLAAC has good teaching and learning efficiency. From the analysis, three students out of 20 students got a full SUS score.

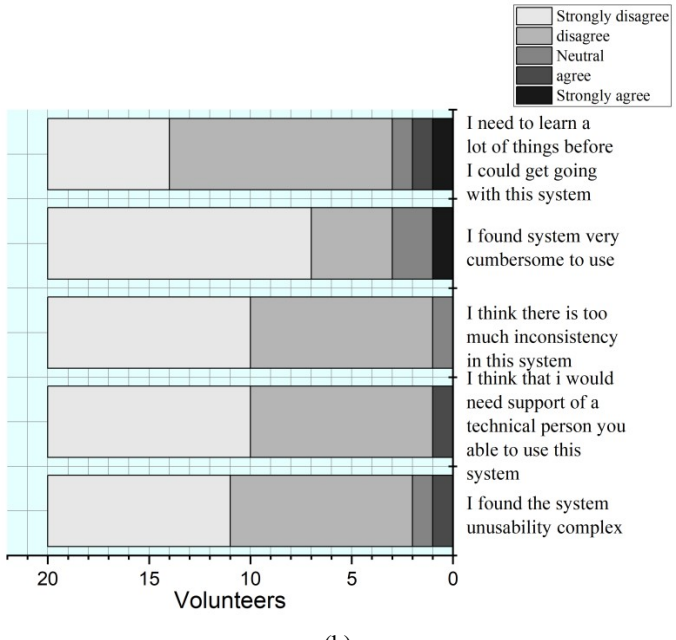
Figure 7(a) shows the student positive feedback of the proposed hybrid approach to EFLAAC. The question like confidentiality of the app usage, easiness of the app usage, various functions integrated with the software, system usage, and system usage asked volunteers. The same questions are invited to a set of students who use the software. Volunteers are people who aren't obligated to use the app. The proposed program is in use by students. Both volunteers and students are asked the same set of questions, and their responses are compared. The feedback is tabulated and plotted in the graph. The feedback like strongly disagree, disagree, neutral, agree, and strongly disagree.

Figure 7(b) shows the negative student feedback of the proposed hybrid approach to EFLAAC. Questions like things to learn before using the app, cumbersome to use the app, inconsistency to the app, need of a technical person to use the app, system complex usability. The questions were asked to a group of students. The responses are tabulated and plotted in the graph. The reactions like strongly disagree, disagree, neutral, agree and strongly agree are calculated from the responses and plotted in the diagram.

Figure 7 (a) Student positive feedback of the proposed hybrid approach to EFLAAC (b) Student negative feedback of the proposed hybrid approach to EFLAAC (see online version for colours)



(a)



(b)

Figure 8 Quality of prediction of the proposed hybrid approach to EFLAAC (see online version for colours)

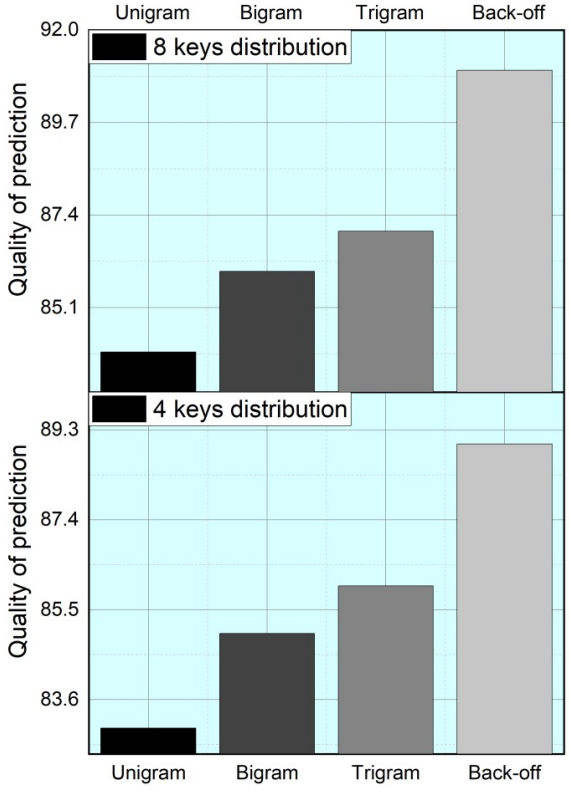


Figure 8 shows the quality of prediction of the proposed hybrid approach to EFLAAC. The proposed EFLAAC is a simulated unigram, bigram, trigram, and backoff method. Based on the analysis, unigram shows the lowest quality in prediction. The backoff method gives the highest process of quality of prediction. Bigram and trigram method shows the moderate output. So the backoff method delivers the highest performance and is used in the proposed way. High-quality projection is achieved because of the hybrid combination of big data and AAC devices.

The proposed hybrid approach to EFLAAC has the highest efficiency comparing to the existing methods. The efficiency and highest quality of prediction are achieved utilising big data. The user feedback is analysed, and it shows that all the users mostly like the proposed system.

5 Conclusions and discussions

ACAA, which can further grow with permanent membership with health professionals, can be deemed a reasonably successful text prediction for Filipino clinicians. The aim is to reduce ELFAAC's future consumer demographic has been accomplished. This system is useful for the further progress of ELFAAC, as the study's cost would be much focused.

The subsequent versions will resolve particular concerns related to these consumer groups' specifications based on the current capabilities of ELFAACs.

Several recommendations have been gathered and provided to meet these above-listed requirements. And the physicians involved have not experienced an AAC app for the Philippines in particular. This system allows the ELFAAC groundbreaking research and, I expect, the first of several someone else to overcome this problem.

5.1 Development

The EFLAAC has reached its best early developmental stage and therefore should not be its final stage. The researchers gathered potential population targets which EFLAAC can best meet. Those that want to improve EFLAAC further should take it into account from the next phase of preparation. Texture feature improvements were also described, and the next version should be strongly regarded.

5.2 Corpus and data structures

EFLAAC would also receive assistance from having a more significant body. At this point, though the application is very usable, many essential words and sentences are curiously missing when EFLAAC is first used. Wishfully adding a broader corpus would not boost the impressive additional right away. Although EFLAAC can accommodate a comprehensive collection of data, the existing back-end configuration is enough for a small community. While using the subcorpora of Bantay Wika, all made relevant for recommendations cannot match common telephone knowledge.

Everything requires the recruitment process impossible; thus, it is impossible to build the entire app even. The investigators could not maximise EFLAAC's back-end to satisfy the Bantay Wika subcorpora due to their time limitations. The development, such as that of the n-gram feature vector, of more extensive and cheaper programming languages should have been critical in improving EFLAAC. This course of change would most certainly best develop the software in its entirety.

5.3 Big data

Web surfing is an effective way to create a phrase repository for EFLAAC. The study was deemed during the development process but was ultimately not followed, as the Web crawler could be a new subject. Although a lot of work is required, EFLAAC might be complemented by implementing a web crawler based on the English language. Although the power of EFLAAC is to learn the grammar of its consumer, it is also its limitation. Because each implementation is effectively a blank canvas, the terms and connections it knows would not communicate with other people. EFLAAC effectively works with 94.9% of accuracy, which is not possible than other approaches.

This system can be considered to boost EFLAAC even more by building a surface word store. Nevertheless, this functionality was not included in this growth course due to possible misuse and internet freedom issues. EFLAAC may significantly improve such a specification.

References

Ahmad, A.I. (2018) 'Use of AAC as a new system in communication disorder', *International Journal of Science and Rehabilitation in Special Needs*, Vol. 473, No. 6324, pp.1–11.

Ahmed, M., Choudhury, S. and Al-Turjman, F. (2019) 'Big data analytics for intelligent internet of things', *Artificial Intelligence in IoT*, pp.107–127, Springer, Cham.

Aujla, G.S., Chaudhary, R., Kumar, N., Das, A.K. and Rodrigues, J.J. (2018) 'SecSVA: secure storage, verification, and auditing of big data in the cloud environment', *IEEE Communications Magazine*, Vol. 56, No. 1, pp.78–85.

Baraiolo, A. (2020) 'The use of AAC devices in preschool-aged children with autism spectrum disorder: a narrative review of interventions', *Undergraduate Review*, Vol. 15, No. 1, pp.7–20.

Cabrera-Solano, P., Gonzalez-Torres, P., Solano, L. and Castillo-Cuesta, L. (2019) 'Using visual vocabulary app as a metacognitive strategy in EFL learning: a case of pre-service teachers', *International Journal of Learning, Teaching and Educational Research*, Vol. 18, No. 12, pp.302–315.

Duggan, M.K. and Walsh, M.E. (2019) 'Evaluating the impact of a 12-week training programme for teaching assistants in using aided language stimulation', *Book of Abstracts*, p.20.

El-Hasnony, I.M., Barakat, S.I., Elhoseny, M. and Mostafa, R.R. (2020) 'Improved feature selection model for big data analytics', *IEEE Access*, Vol. 8, No. 99, pp.66989–67004.

Elmquist, M., Simacek, J., Dimian, A.F. and Reichle, J. (2019) 'Impact of aided AAC interventions on speech comprehension of children with neurodevelopmental disabilities: a critically appraised topic', *Evidence-Based Communication Assessment and Intervention*, Vol. 13, Nos. 1–2, pp.67–84.

Hirneisen, T.N. (2020) *Perspectives of Adults Who Use AAC and Their Caregivers on Technology Supports and Challenges Post-secondary Graduation*, Doctoral dissertation, Misericordia University.

Hoyos, A.A.C. and Velásquez, J.D. (2020) 'Teaching analytics: current challenges and future development', *IEEE Revista Iberoamericana de Tecnologias del Aprendizaje*, Vol. 15, No. 1, pp.1–9.

Kacetl, J. and Klímová, B. (2019) 'Use of smartphone applications in English language learning – a challenge for foreign language education', *Education Sciences*, Vol. 9, No. 3, p.179.

Kadry, S. and Ghazal, B. (2019) 'Design and assessment of using a smartphone application in the classroom to improve students' learning', *International Journal of Engineering Pedagogy*, Vol. 9, No. 2, pp.17–34.

Klimova, B. (2018) 'Mobile phones and smartphones and their apps for teaching English as a foreign language', *Education and Information Technologies*, Vol. 23, No. 3, pp.1091–1099.

Kumari, A., Tanwar, S., Tyagi, S. and Kumar, N. (2018) 'Verification and validation techniques for streaming big data analytics in Internet of things environment', *IET Networks*, Vol. 8, No. 2, pp.92–100.

Light, J., McNaughton, D. and Caron, J. (2019) 'New and emerging AAC technology supports children with complex communication needs and their communication partners: state of the science and future research directions', *Augmentative and Alternative Communication*, Vol. 35, No. 1, pp.26–41.

Makoe, M. and Shandu, T. (2018) 'Developing a mobile app for learning English vocabulary in an open distance learning context', *International Review of Research in Open and Distributed Learning*, Vol. 19, No. 4, pp.208–221.

Manogaran, G., Shakeel, P.M., Baskar, S., Hsu, C.H., Kadry, S.N., Sundarasekar, R., … and Muthu, B.A. (2020) 'FDM: fuzzy-optimized data management technique for improving big data analytics', *IEEE Transactions on Fuzzy Systems*, Vol. 29, No. 1, pp.177–185.

McNaughton, D., Light, J., Beukelman, D.R., Klein, C., Nieder, D. and Nazareth, G. (2019) 'Building capacity in AAC: a person-centred approach to supporting participation by people with complex communication needs', *Augmentative and Alternative Communication*, Vol. 35, No. 1, pp.56–68.

Mei, B., Brown, G.T. and Teo, T. (2018) 'Toward an understanding of preservice English as a foreign language teachers' acceptance of computer-assisted language learning 2.0 in the People's Republic of China', *Journal of Educational Computing Research*, Vol. 56, No. 1, pp.74–104.

Moorcroft, A., Scarinci, N. and Meyer, C. (2019) 'A systematic review of the barriers and facilitators to the provision and use of low-tech and unaided AAC systems for people with complex communication needs and their families', *Disability and Rehabilitation: Assistive Technology*, Vol. 14, No. 7, pp.710–731.

Nieto, Y., García-Díaz, V., Montenegro, C. and Crespo, R.G. (2019) 'Supporting academic decision making at higher educational institutions using machine learning-based algorithms', *Soft Computing*, Vol. 23, No. 12, pp.4145–4153.

Ogletree, B.T., McMurry, S., Schmidt, M. and Evans, K. (2018) 'The changing world of augmentative and alternative communication (AAC): examining three realities faced by today's AAC provider', *Perspectives of the ASHA Special Interest Groups*, Vol. 3, No. 12, pp.113–122.

Ostroff, A.E. and Da Fonte, M.A. (2018) 'Special education teachers can embed AAC in the classroom!', *Journal of the International Association of Special Education*, Vol. 18, No. 1, pp.70–73.

Rinaldi, B. (2019) *Effects of Naturalistic Time Delay on Promoting Functional Requests Using AAC in Preschoolers with Autism Spectrum Disorders*.

Rosell-Aguilar, F. (2018) 'Autonomous language learning through a mobile application: a user evaluation of the BUSUU app', *Computer Assisted Language Learning*, Vol. 31, No. 8, pp.854–881.

Rosli, S.B. (2019) 'The use of alternative and augmentative communication (AAC) in classroom settings: a case study', *3rd International Conference on Special Education (ICSE 2019)*, December, Atlantis Press.

Ryabkova, V.V. (2019) 'Mobile devices and apps for developing language skills (on the example of the English language) ', *Perspectives of Science & Education*, Vol. 38, No. 2, pp.867–876.

Shakeel, P.M., Baskar, S., Fouad, H., Manogaran, G., Saravanan, V. and Montenegro-Marin, C.E. (2021) 'Internet of things forensic data analysis using machine learning to identify roots of data scavenging', *Future Generation Computer Systems*, Vol. 115, No. 9, pp.756–768.

Shegay, A., Orazova, F. and Krivosheeva, G. (2020) 'Possible writing techniques while teaching for students whose English is a foreign language', *European Journal of Research and Reflection in Educational Sciences*, Vol. 8, No. 6, pp.163–174.

Simacek, J., Pennington, B., Reichle, J. and Parker-McGowan, Q. (2018) 'Aided AAC for people with severe to profound and multiple disabilities: a systematic review of interventions and treatment intensity', *Advances in Neuro Developmental Disorders*, Vol. 2, No. 1, pp.100–115.

Singh, A., Garg, S., Kaur, R., Batra, S., Kumar, N. and Zomaya, A.Y. (2020) 'Probabilistic data structures for big data analytics: a comprehensive review', *Knowledge-Based Systems*, Vol. 188, No. 5, p.104987.

Son, J.B. (2018) 'Technology in English as a foreign language (EFL) teaching', *The TESOL Encyclopedia of English Language Teaching*, pp.1–7, John Wiley & Sons, USA.

Tso, W.B. (2020) 'An investigation of the effectiveness of English language apps for EFL vocabulary building', *Journal of Global Literacies, Technologies, and Emerging Pedagogies*, Vol. 5, No. 1, pp.1083–1102.

Varatharajan, R., Manogaran, G. and Priyan, M.K. (2018) 'A big data classification approach using LDA with an enhanced SVM method for ECG signals in cloud computing', *Multimedia Tools and Applications*, Vol. 77, No. 8, pp.10195–10215.

Wu, W., Lin, W., Hsu, C.H. and He, L. (2018) 'Energy-efficient Hadoop for big data analytics and computing: A systematic review and research insights', *Future Generation Computer Systems*, Vol. 86, pp.1351–1367.